Page 17, substitute for the paragraph beginning on line 15:

It is essential and necessary for a winding in a power transformer/reactor according to the invention that at least one of the strands of the conductor 5 is uninsulated and arranged such that it has good electrical contact with the inner semiconducting layer 6. The inner layer will thus always remain at the potential of the conductor. Alternatively, different strands may be alternately conducting with electrical contact with the inner semiconducting layer.

Page 17, substitute for the paragraph beginning on line 24:

As far as the rest of the strands 5A are concerned, all of them or some of them may be varnished and hence insulated.

**IN THE DRAWINGS:**

It is proposed to add reference numerals 5a and 5b to Fig. 2.

## REMARKS

This Amendment is in response to the Official Action of August 13, 2001, in which the Examiner reiterated certain rejections to the specification, claims and drawings.

Applicants have amended the specification to refer to the uninsulated and insulated strands 5a and 5b and to place the reference numerals in the corresponding drawing. No new matter has been presented.

The Examiner has asserted that Applicants have failed to successfully argue certain points raised in the prior Office Action. Applicants respectfully disagree and would make the following comments following the Examiner's response beginning on page 7 of the Detailed Action.

Regarding item [1], the specification at page 13, line 29, designates the cable as being a "flexible cable." Applicants have referred to the flexible cable at page 13, line 29 and have reiterated the same at page 15 beginning on line 31 through page 16, line 2. The specific portions of the cable are recited.

Regarding the Examiner's argument [2], the Examiner's objection is not understood. It is believed that one of ordinary skill in the art would understand that the term "substantially" means that there are essentially no cracks or defects in the boundary lying between the semiconducting layers which would give rise to the problem of partial discharge as set forth in the specification and which is hereinafter discussed. Applicants do not believe that it is necessary to recite a perfect structure. Those of ordinary skill in the art know how to make a cable and a cable formed of the materials set forth in the specification having certain properties and formed of certain materials as recited would be free of defects of the type which would cause the cable to fail under high voltage conditions.

With respect to the Examiner's argument [3], the term "partial discharge" is set forth on page 13, line 36 and is explained thereafter on page 14, line 7. Partial discharge is a phenomenon in which corona discharge occurs as a result of pores or defects in the insulating layer. The term is well known to those of ordinary skill in the art and the specification sets forth the fact that partial discharges are known on page 13, line 36.

Regarding the Examiner's argument [4], Applicants do not disagree that the transformer of Grimes operates at a voltage on the order of 10 kV. However, Applicants do not agree with the implication asserted by the Examiner that such a range would thereby obviate the invention. It is clear that the present invention operates at very high voltages, for example 800 kV or higher, without the conventional protections which are used in conventional transformers. If Grimes has an operating range on the order of 10 kV, that is the maximum at which the transformer may operate. On the other hand, the present invention operates at transmission line voltages and

Grimes would not be operable at such high voltages, *i.e.*, voltages in the transmission and distribution range.

Regarding the Examiner's argument [5], the disclosure of the invention taken as a whole precludes the necessity for a cooling liquid or insulating liquid. The present invention operates such that the outer layer of the cable is at or near ground potential. As such, an insulating liquid is not required. Indeed, the Background of the Invention discusses the disadvantages of oil cooling and insulation as set forth on page 13, lines 33-36 wherein one of the objects of the invention is to provide a transformer which does not entail the disadvantages which were associated with prior art oil filled power transformers.

Regarding the Examiner's argument [6], the disclosure in Elton is limited to a pyrolyzed glass layer which is useful in three applications, namely: in the end winding region of a conventional low voltage, high current rotating electric machine having bar type windings; in the layer or layers of a transmission and distribution cable; and in a grounding layer of a shielded box for protecting electronic equipment. Nowhere in Elton is there a suggestion that the described cable could be useful as the winding in a transformer.

Regarding the Examiner's argument [7] that Elton teaches that a cable can be used in other electrical devices, it should be stressed that the electrical windings described in Elton are conventional rigid bar-type windings. There is no suggestion in Elton that a flexible cable could be used as the winding. Indeed, the disclosure in Elton is totally contrary to the teachings of the present invention because it would be impossible to make a winding using the cable in Elton. In order to manufacture the cable, it would be necessary to cure the semiconducting pyrolyzed glass layer. Once cured, the layer would be rigid and brittle. As a result, if it was wound to form a winding of a transformer, it would crack and thereby be susceptible to failure as a result of partial discharge. If the pyrolyzed glass layer is not cured, then it would be necessary to prepare and manufacture a winding according to a complicated and impractical process in which the uncured

winding would have to be assembled and then cured *in situ*. This is clearly contrary to the teachings of the present invention in which the specification describes the already-formed cable as being wound on the core limbs to manufacture the transformer according to the invention.

Regarding the Examiner's argument [8], the problems described and allegedly solved by Takaoka have to do with the transmission and distribution of power. Indeed, Takaoka has for one of its purposes handling high power. However, when used as a transmission and distribution line, the structure of Takaoka has an entirely different response to the magnetic fields associated with the transmission and distribution of power than such a structure might have if used as a winding in an electric machine such as a transformer. In Takaoka, the so-called skin effect has to do with self-induced currents. These are not the same as eddy currents, which result when a conductor interacts with a magnetic field in a transformer. Further, in Takaoka, the outer strands are insulated because this is where the skin effect occurs whereas, in the present invention, the outer conductors are not insulated because they must be in electrical contact with the semiconducting layer in order to form the potential surface. It is submitted that what is going on in Takaoka has nothing to do with the function of a transformer.

Regarding the Examiner's argument [9], this assertion is flatly denied by the Applicants. One of ordinary skill in the art would not be motivated to use a power transmission cable in the winding of a power transformer. This is supported by the arguments of Linsley and Aabo and are in direct opposition to the Examiner's arguments [10] and [11] as well. Linsley and Aabo are saying that those of ordinary skill in the art would not use the winding of Takaoka in a machine according to the invention.

Further, Linsley and Aabo do preclude the use of the cable of Takaoka in the winding of a transformer. Aabo has directly stated that he does not consider the cable winding to be analogous to an electric transmission cable. The cable winding of the invention is a special purpose cable designed specifically for use as a winding in a transformer. Aabo is unaware of any

electric power transmission cable that could be operational as a substitute for a cable winding in a high power, high voltage transformer according to the invention. Aabo says that he cannot imagine that any one solution could solve both problems of a transmission line and a transformer. *See* paragraph 28 of Aabo's Declaration.

Linsley, likewise, asserts that the transmission and distribution cable would not be suitable for use as the winding in a transformer, especially one with a metallic screen which would provide an eddy current path leading to undesirable losses. It is reasonable for one skilled in the art to assume that a transmission and distribution cable has one or more metallic layers which make it unsuitable for use as winding in a transformer. This is the thrust of the Aabo and Linsley Declarations. Linsley says it would be undesirable to employ a cable for distribution and transmission of electrical power in the winding of a high power transformer. Such an arrangement would not operate satisfactorily and likely result in failure. Takaoka is a conventional transmission and distribution cable and it has all of the shortcomings that Linsley asserts would be harmful to a transformer, *e.g.*, one or more metallic layers which could cause the winding to fail due to induced eddy currents.

These shortcomings may not be ignored. The references do not emphasize these features because they are not relevant to what the references are discussing. Here, the layers which could cause problems in a transformer do not disappear. They are necessary in a transmission and distribution cable and they would result in failure in a transformer winding. Thus, it is believed that the Declarations of Linsley and Aabo preclude the cables of Elton and Takaoka as useful in a power transformer.

The attached Declaration of Mr. Hirt identifies and discusses the efforts by competitors of ABB to develop high voltage rotating machines in response to the revolutionary powerformer technology represented by the present invention. The Declaration also points out efforts by the U.S. Government supporting the development of such technology. The Declaration has attached

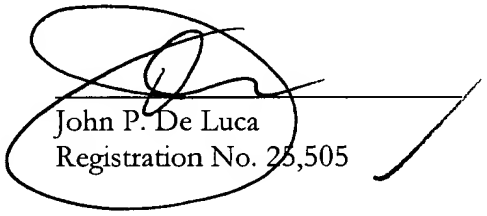
copies of later-filed patent applications. If this technology is obvious, why have significant development efforts been commenced in direct response to ABB's inventions? Applicants believe the answer is resoundingly clear: the invention is not obvious!

Although the Hirt Declaration was filed in a related application, the Hirt Declaration is relevant to the present application because it discusses the efforts of the U.S. Government and third parties to develop high voltage systems (rotating machines). The present invention and the related application employ similar techniques to achieve practical high voltage operations. It is requested that the Declaration be considered herein without the need for a separately executed submission.

In view of the foregoing, it is therefore respectfully requested that the Examiner reconsider his rejection of the claims, the allowance of which is earnestly solicited.

If filing this paper or any accompanying papers necessitates additional fees not otherwise provided for, the undersigned authorizes the Commissioner to deduct such additional fees from Deposit Account No. 04-2223.

Respectfully submitted,



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## VERSION WITH MARKINGS TO SHOW CHANGES MADE

## IN THE SPECIFICATION:

Page 15, substitute for the paragraph beginning on line 32:

According to the invention, the winding/windings is/are thus preferably made in the form of a flexible cable (as shown in Fig. 2) comprising at least one conductor comprising a number of strands 5, including insulated strands 5A and uninsulated strands 5B, and with an inner semiconducting layer 6 around the strands 5. Outside of this inner semiconducting layer 6 is the main insulation of the cable in the form of a solid insulation 7, and around this solid insulation is an outer semiconducting layer 8. The cable may in certain contexts have additional outer layers.

Page 17, substitute for the paragraph beginning on line 15:

It is essential and necessary for a winding in a power transformer/reactor according to the invention that at least one of the strands of the conductor 5 is uninsulated and arranged such that it has good electrical contact [is achieved] with the inner semiconducting layer 6. The inner layer will thus always remain at the potential of the conductor. Alternatively, different strands may be alternately conducting with electrical contact with the inner semiconducting layer.

Page 17, substitute for the paragraph beginning on line 24:

As far as the rest of the strands 5A are concerned, all of them or some of them may be varnished and hence insulated.

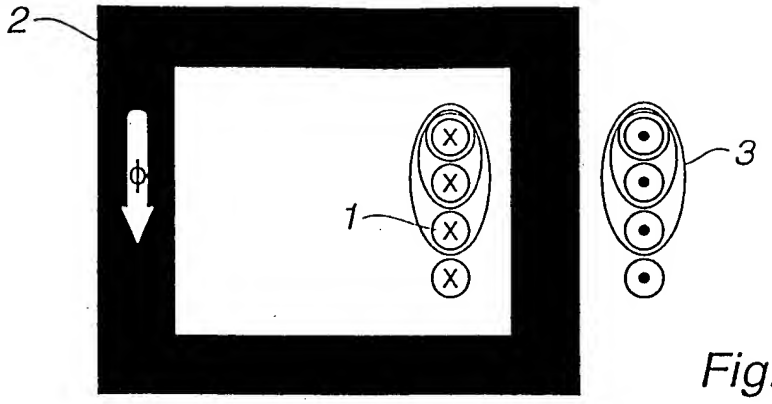


Fig. 1

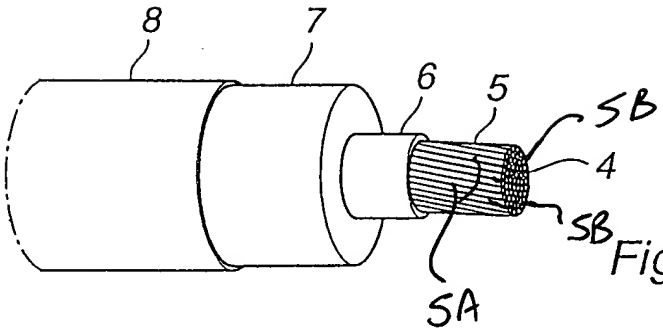


Fig. 2

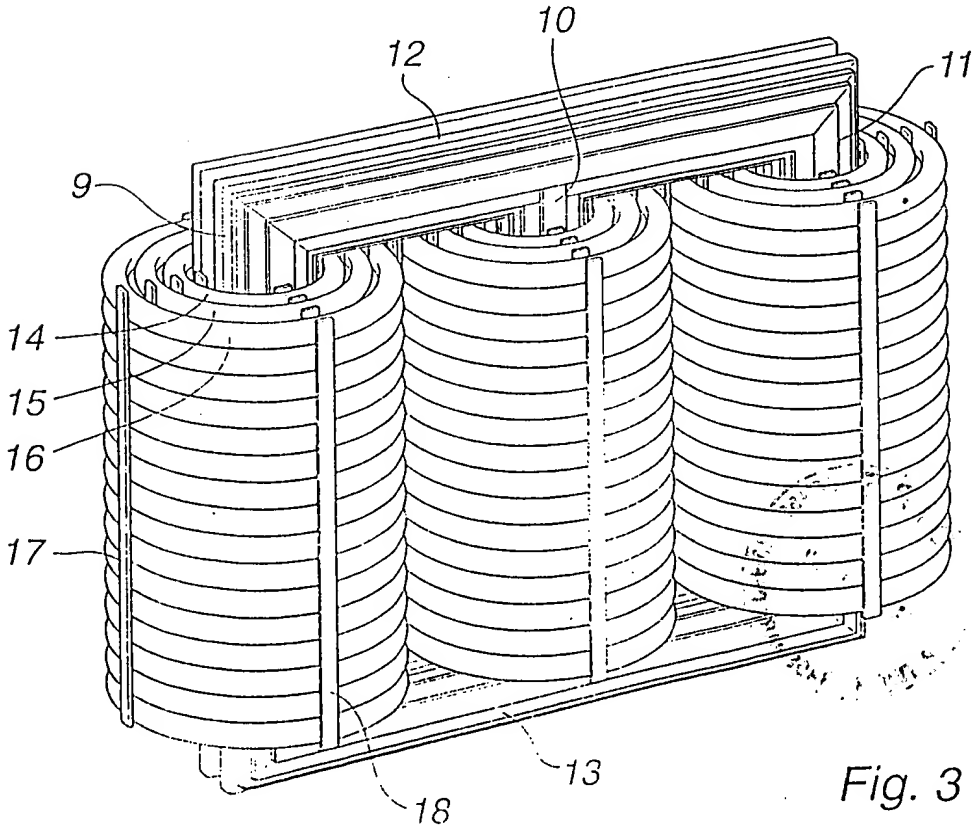


Fig. 3